

Utilization of excreta ashes in vegetable cultivation

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Abstract : The effects of excreta ashes on growth and development of selected vegetables were investigated for three years.

Heavy application of excreta ashes produced higher fresh weight of carrots. The application of excreta ashes did not affect the time of harvesting in broccoli. However, broccoli plants applied with excreta ashes produced higher terminal and lateral head weights, head diameter and stem growth compared to the control plants.

The fresh and dry weights of Welsh onion were higher in the plants applied with excreta ashes. Leaf number and maximum leaf growth of Welsh onion were increased with the application of excreta ashes. The electrical conductivity of the soil increased when excreta ashes was incorporated while, the pH of the soil remained neutral.

It is concluded from these results that application excreta ashes had fertilizer-like effects on growth and yields of selected vegetables. (Accepted September 10, 2001)

Key words : Excreta, Burnt ash, Carrot, Welsh onion, Broccoli, Growth, Yield

Introduction

Excreta was utilized as manure from ancient times worldwide. Fresh excreta is germless but its handling process gives unsanitary problems, therefore stored or decomposed one is preferably used. Because of sanitary concerns even decomposed excreta are not used in Japan today. Another problem is the use of increasing sewage sludge production. Scientists asked to treat these excreta and sewage sludge to decrease the amount or to recycle them as a natural resources. One solution is to burn them and use the ash as manure or compost.

Imagawa(1987), Shirai(1995) and Shiomi(1994) have proposed on how to use the ashes of these excreta and sewage sludge as manure or compost.

In this experiment, effects of excreta ashes on the growth and yield of selected vegetables were investigated.

Materials and Methods

Three cultivars of carrot, Kinko-yon-sun, Kinko-go-sun and Asuharu-go-sun and six cultivars of broccoli, De Cicco, Marshal, Green Comet, Haitsu, Gurieru and Shaster, were used in 1993. In 1992, six cultivars of Welsh onion, Tact, Choju, E-347, Kuro-senbon, Wakasama and Kincho, were used. In 1993, four cultivars of broccoli, De Cicco, Marshal, Green Comet and Gurieru, and four cultivars of Welsh onion, Tact, Choju, Wakasama and

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Kincho, were used.

The area where carrots were grown was applied with excreta ashes at the rate of 0, 8, 16, 24 kg/3m². The excreta ashes was applied 50 cm depth before planting. The area for other vegetables was applied with excreta ashes at the rate of 0 and 1m³ before planting. Two plots (1.2 m wide and 10 m long) were constructed from the area applied with excreta ashes. Eighty percent of the necessary nutrients was supplied by slow release fertilixer (16N 10P 24K kg/10 a). Plant growth and yield were measured at one month interval. There were 20 sample plants per treatment and each treatment was replicated twice. Electrical conductivity and pH of the soil were measured before, during and after application of excreta ashes.

In the Takamatsu city, the chemical content of excreta ashes was 0.85N, 2.33P and 2.00P.

Results and Discussion

Although the absorption of foods of plants are different in their nutritional requirements and dosage, in Japan, it is reported that 95% water, 0.5-0.7% nitrogen, 0.1-0.2% phosphoric acid, 0.2-0.3% potassium and 1% salt are absorbed (Fujiwara, 1986).

Yield of carrots increased with heavy application of excreta ashes (Fig. 1). However, it was not confirmed whether growth of carrots was affected with the high concentration of excreta ashes.

Harvesting time of broccoli was not affected with excreta ashes. The terminal and lateral head weights were increased in the plants applied with excreta ashes. The effects in cvs. Haitzu, Gurieru and Shaster were more prorioanced than in earlier cvs. De Cicco, Marshal, Green Comet. The terminal head diameter and stem growth increased in the plants applied with excreta ashes (Table 1). The result is in support of the earlier report by Fujime and Hirose, 1981 that an increase of head weight of broccoli is closely related with stem diameter.

The leaf number and maximum leaf length of Welsh onion increased in the excreta ashes treatments. The application of excreta ashes tended to produce higher fresh weight of shoot in Welsh onion (Fig. 2). In contrast, however, control plants produced higher fresh weight of roots.

The electrical conductivity was higher in the excreta ashes treated sois, while the pH values remained neutral (Fig. 3). Fujiwara(1986) reported the quick effect excreta ashes on soil pH, while the effect on electric conductivity is also quick but in very short period of time.

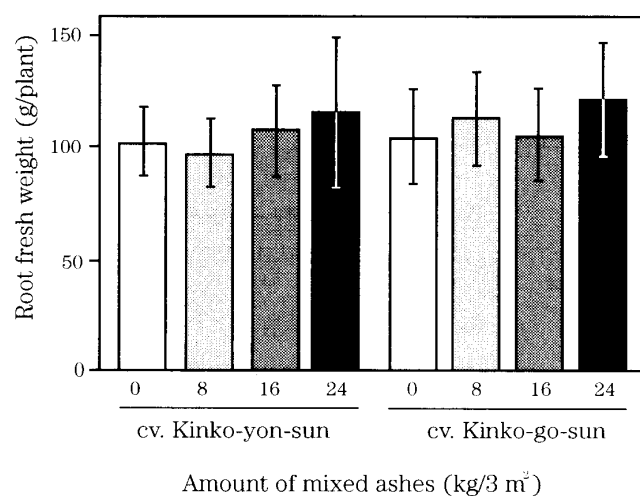


Fig. 1. Effects of excreta ashes application on the root fresh weight of carrots (1991). Error bars represent S.D. of the means (n=12).

Table 1. Effects of excreta ashes on terminal head of broccoli (1993).

Cultivar name	Diameter of head (cm)		Height of head (cm)		Fresh weight of head (g)	
	Excreta ashes	Control	Excreta ashes	Control	Excreta ashes	Control
De Cicco	14.0 ± 3.1	11.1 ± 1.9	15.0 ± 3.1	15.5 ± 4.1	165.0 ± 64.5	133.6 ± 76.7
Marshal	14.4 ± 3.3	12.3 ± 2.7	12.3 ± 3.1	10.0 ± 1.4	201.4 ± 126.9	173.0 ± 84.7
Green Comet	13.1 ± 2.4	13.0 ± 1.9	9.9 ± 3.1	11.5 ± 2.0	209.6 ± 62.8	183.5 ± 74.2
Gurieru	13.4 ± 1.9	10.0 ± 1.4	9.6 ± 3.1	8.4 ± 1.8	8.4 ± 53.6	102.3 ± 28.1

Error bars represent S.D. of the means (n=12).

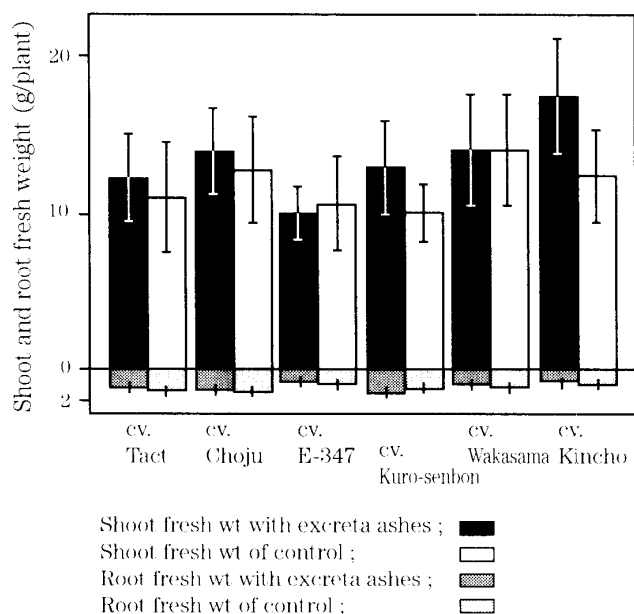


Fig. 2. Effects of excreta ashes on fresh weight of shoot and root of Welsh onion (1991). Error bars represent S.D. of the means (n=12).

It is concluded from these results that the application of excreta ashes had a fertilizer-like effect on growth and yields of selected vegetables.

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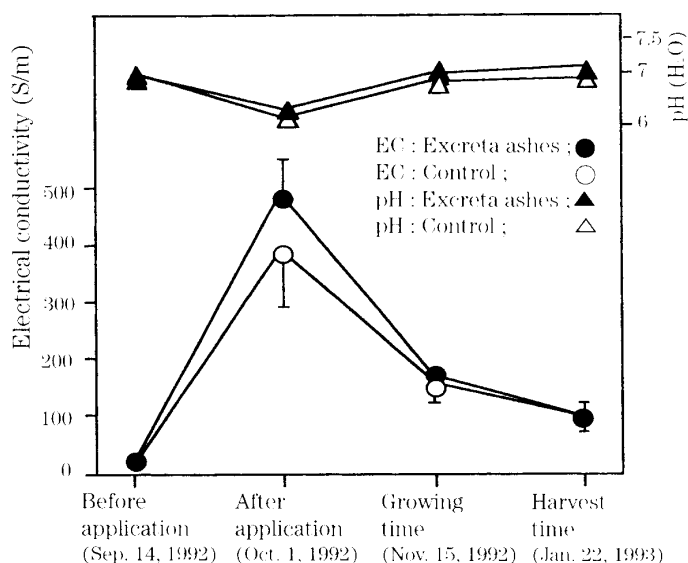


Fig. 3. Change of electrical conductivity (EC) and pH in the soil (1992). Error bars represent S.D. of the means (n=7).

数種の野菜栽培における焼却排泄灰の利用

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摘要：排泄物の焼却灰を土壤に混和して、野菜の生長と発育に及ぼす影響を3年間調査した。ニンジンの新鮮重は土壤に混和される量に応じて増加した。ブロッコリーの収穫時期は混和される焼却灰処理の影響を受けなかったが、頂花らい重と側花らい重は増加した。頂花らいの直径と茎の生長も増加した。

ネギの葉数と最大葉長は混和される焼却灰処理により増加した。ネギの新鮮重と乾物重も同様に増加した。土壤のEC値は焼却灰処理により増加したが、pH値は変化しなかった。

以上の結果から、焼却排泄灰は土壤に混和されると数種野菜の生長と収量に対して肥料効果を持っていると考えられた。